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N852

(56) Documents Cited  
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GB 1135351 A GB 0939601 A GB 0721888 A  
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## (54) Fused switch arrangement

(57) A switched fuse spur unit comprises a base 2 and a face plate 1. The face plate 1 is formed with a first opening which retains a rocker switch 30. A drawer-like fuse carrier assembly 29 which removably retains the fuse 23 is inserted into the unit via a second opening in the face plate 1, the outer wall of the assembly forming a closure over the second opening when the fuse carrier assembly 29 is fully inserted into the unit. A protrusion 40 is provided on the inner surface of the outer wall of the fuse carrier assembly, and a tab 42 extends from the lower end of the switch 30, such that when the switch is in the OFF position, the tab 42 and the protrusion 40 allow the fuse carrier assembly 29 to be inserted into and removed from the unit. When the switch is in the ON position, the fuse carrier assembly 29 cannot be inserted and any attempt to remove an inserted fuse carrier assembly results in the switch being toggled into the OFF position.

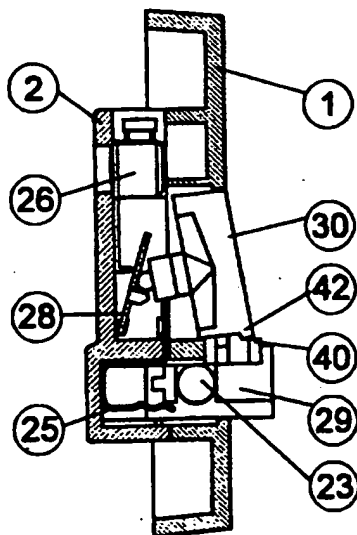


FIG 4

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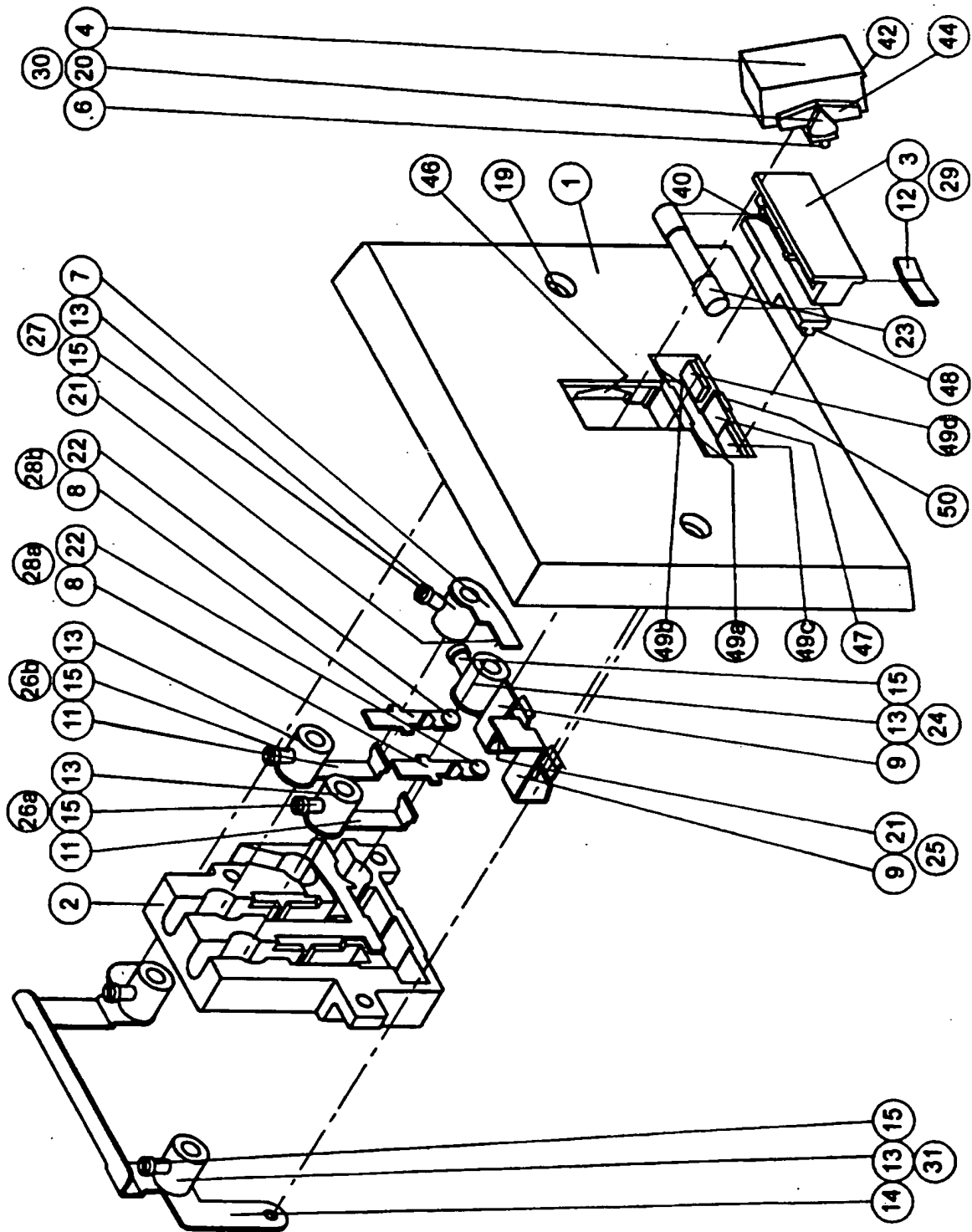
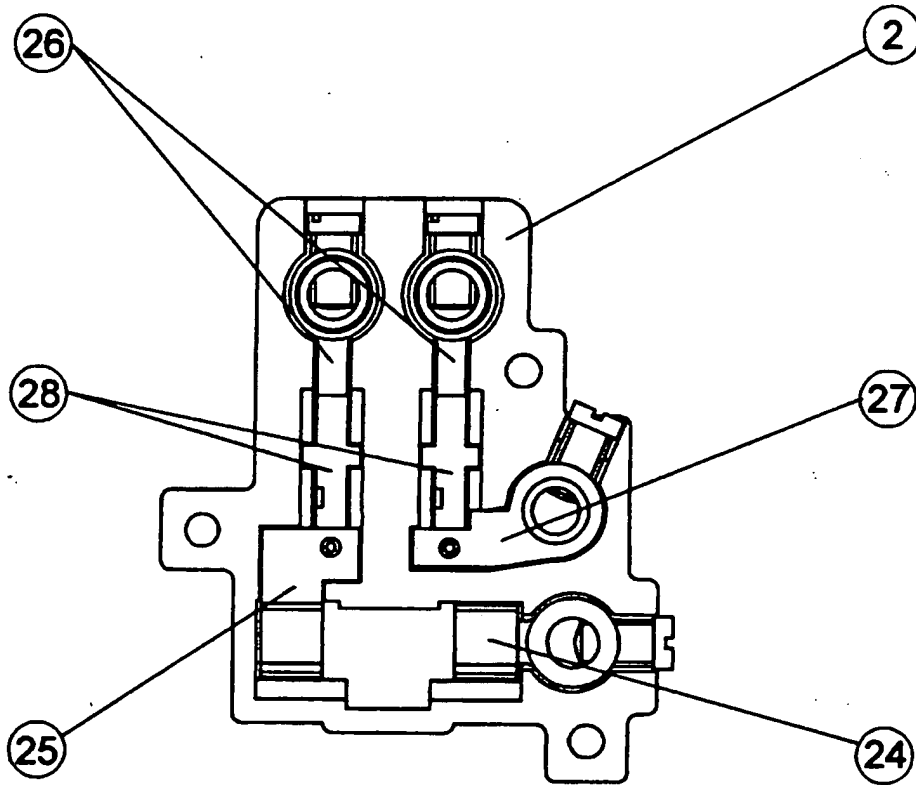
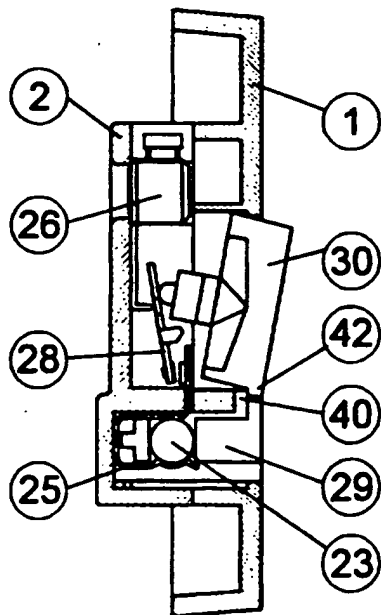


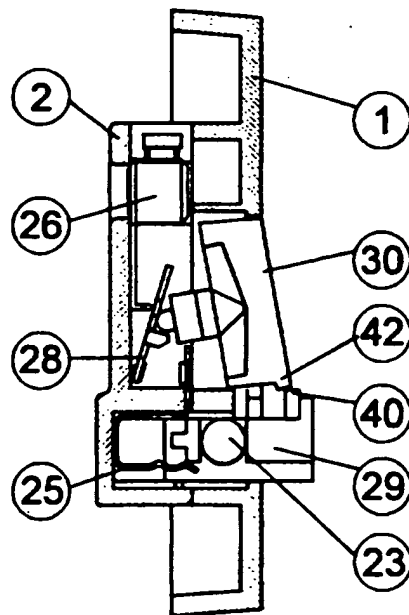
FIG 1



**FIG 2**



**FIG 3**



**FIG 4**

**FUSED SWITCH ARRANGEMENT**

This invention relates to a fused switch arrangement and more particularly to an electrical fuse arrangement for use in an electrical switched spur unit and the like.

For safety reasons, it is relatively common for large electrical appliances, such as domestic appliances, to be permanently wired into a nearby socket which is set into a wall, for instance, such that the live connections are relatively inaccessible. Generally, all that is then visible is a flex which extends from the appliance to the mains connection via an aperture in a face plate which is affixed to the wall. Any fixed appliance which is fed from a ring main within a hard wired connection must employ a spur unit incorporating a BS1362 fuse with a maximum rating of 13 amps. Failure to employ local fuse protection would leave the appliance protected only by the ring main circuit protection of 30 amps, which is illegal.

However, it may be necessary for maintenance and repairs to be performed on the appliance from time to time, which often requires the power to the appliance to be cut off. For this reason, a switched spur unit is usually provided which enables the power to the appliance to be cut-off, without having to remove the face plate and disconnect the wires.

Such a spur unit usually comprises a rocker switch which is held within a generally rectangular aperture in a second face plate which is also usually fixed to the wall. In its OFF position, the rockers are arranged to break the circuit between the electrical appliance and the mains power, thus cutting off the supply. In most cases, the circuit includes a fuse which is intended to break the circuit in the event of a current overload caused by a fault. The fuse is generally held within a fuse carrier arrangement which extends into the spur unit via an opening in the face plate. The fuse carrier

arrangement can then be removed from the unit, thereby allowing access to the fuse in order to enable it to be replaced or tested, for example. For safety reasons, it is important to ensure that the rocker switch is in its OFF position, i.e. the electrical circuit is broken, before removing the fuse. However, in known arrangements, it is possible to gain access to the fuse carrier arrangement and remove the fuse while the rocker switch is in its ON position. It is also possible to re-insert the fuse while the rocker switch is ON. This is undesirable because of the possibility of arcing which can reduce the life of the switch. We have now devised an arrangement which seeks to overcome this problem.

In accordance with the present invention there is provided a switch unit, comprising a switch having first and second operational positions for respectively opening and closing an electrical circuit, said electrical circuit including in series a removable fuse insertable between terminals of the circuit, the switch unit further comprising means for mechanically preventing said fuse from being removed from and/or inserted between the said terminals of said electrical circuit when said switch is in said second operational position, but for allowing such removal and/or insertion when said switch is in said first operational position.

The switch unit preferably comprises a face plate for affixing to a mounting box. The face plate is preferably formed with a first opening for retaining the switch in an accessible position.

The fuse, which is preferably of the conventional cartridge type, may be retained in the electrical circuit by means of a fuse carrier assembly. The carrier assembly may comprise a drawer-like member which can be inserted into and drawn out of or removed from the switch unit via a second opening in the face plate which is positioned adjacent to the first opening. Preferably, an outer wall of the drawer-like member lies substantially flush with the face plate when it is fully inserted. In a

preferred embodiment the outer wall of the drawer-like member has an area which is substantially equal to that of the second opening in the face plate such that it forms a closure for the second opening when the fuse carrier assembly is fully inserted into the switch unit.

The means for preventing the fuse from being removed may be arranged to move the switch into its first operational position if an attempt is made to remove the fuse while the switch is in its second operational position.

The switch may be arranged to prevent insertion/removal of the fuse only when the switch is in its second operational position.

Alternatively, the unit may be arranged to prevent removal/insertion of the fuse when the switch is either at its second operational position or in a predetermined range of intermediate positions between its first and second operational positions. The predetermined range may be a portion only of the range of positions between its first and second positions.

The means for preventing the fuse from being removed from and/or inserted into the electrical circuit when the switch is in the second operational position may comprise a protrusion which is fixed to or integral with the inner surface of the outer wall of the drawer-like member at the edge which is adjacent to the first opening in the face plate. In addition, the switch, which is preferably a rocker switch, is preferably provided with a projection which is affixed to or integral with the end of the switch which is adjacent to the second opening in the face plate, such that when the end of the switch having the projection has been pushed inwards and the switch is in its second operational position, the projection creates a barrier to the protrusion on the fuse carrier assembly so as to prevent the fuse carrier assembly from being inserted into or drawn out from the switch unit.

The switch unit of the present invention may be incorporated in a spur unit.

An embodiment of the present invention will now be described by way of example only and with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of the elements making a spur unit incorporating a switch unit in accordance with the present invention;

Figure 2 is a front view of the base of the spur unit of Figure 1;

Figure 3 is a side view of the spur unit of Figure 1 when the switch is in the OFF position; and

Figure 4 is a side view of the spur unit of Figure 1 when the switch is in the ON position.

Referring to Figures 1 and 2 of the drawings, a spur unit incorporating a switch unit according to the present invention is formed by a base 2, which may be moulded from synthetic plastic and a face plate 1, which may also be moulded from synthetic plastic. The base 2, and the face plate 1, are held together by self tapping screws 16, not shown, to form the complete spur housing. The self tapping screws 16, extend through three moulded apertures in the base 2, and make screw threaded engagement in corresponding recesses moulded into the face plate 1. The base 2, and face plate 1, are held in register by a spigot on the base 2, and a matching recess in the face plate 1, and by the switch rocker assembly 30, and the fuse carrier assembly 29, described in detail later.

The live and neutral connections of an electrical circuit (not shown) are made separately, to two pivot assemblies 26 a and b respectively, and retained in place by brass screws 15. Each pivot assembly 26a, b, comprises a round terminal 13, formed of brass for example, with screw 15, which is spun riveted to a pivot 11 when the unit is assembled, which may be a pressing made from 1/2 hard brass. The opposite end of the

pressing, from the terminal 13, and screw 15, is bent up at approximately 90 degrees. This end is pinched to form a knife edge. These two assemblies are held separately in the base 2, by virtue of a moulded cavity closely following the shape of the assembly and by the face plate 1, being in close proximity to the tops of the terminals 13, when the unit is assembled.

A moving contact carrier assembly 28, which comprises a moving contact carrier pressing 8, and, for example, a silver contact 22, riveted to one end, see-saws on top of each respective pivot assembly 26 which functions as a knife edge fulcrum. The moving contact carrier pressing 8 is preferably manufactured in 1/2 hard brass and has an inlaid strip of, for example, silver across the component in a generally central position. The silver inlay rests on top of the knife edge of the pivot assembly 26, and the silver contact faces upwards. The moving contact carrier assembly 28 is kept in position, both longways and crossways, by a lug extending on each side of the pressing being retained closely by two channels in the base 2, and by the action of the switch rocker assembly 30, explained in detail later.

The silver contact 22 on the live moving contact carrier assembly 28a is free to meet a contact 21, which may be silver, on the fuse clip (in) assembly 25, when toggled by the switch rocker assembly 30. The fuse clip (in) assembly 25, comprises a contact 21, which may be formed of silver, and which is riveted to the underside of one end of the fuse clip (in) pressing 9. The fuse clip (in) pressing 9, is preferably made from spring tempered brass and is in the form of a "U" section with a lug bent outwards at 90 degrees from the top of the one side of the "U" and a half round form half way down the other leg of the "U" which acts as a detent to retain the fuse cartridge 23 (hereinafter called a fuse). The fuse clip (in) assembly 25 is retained in the base 2 by a cavity on a plateau in the base 2,



closely following the shape of the 90 degree tab and the close proximity of the face plate 1 to this tab when the unit is assembled. The "U" form extends down into the base 2, in a cavity which eventually holds the fuse 23, and fuse carrier assembly 29, described later. The rear of the lower end of the "U" rests against a block moulded into the back of this cavity in the base 2, to prevent the fuse clip (in) assembly 25 from turning.

The silver contact on the neutral moving contact carrier assembly 28b is free to meet a silver contact 21 on the fixed contact carrier assembly 27, when toggled by the switch rocker assembly 30, as will be explained in detail later. The fixed contact carrier assembly 27, comprises a round terminal 13 of, for example, brass with a screw 15 which may also be brass, which is spun riveted into a fixed contact carrier pressing 7 when the unit is assembled. The fixed contact carrier pressing 7 is a generally flat blank made from 1/2 hard brass, extending out from the terminal 13, on one side only. At the end of this extension is riveted a contact 21 of, for example, silver, to the underside of the pressing. The fixed contact carrier assembly 27 is retained in the base 2 by a cavity on a plateau in the base 2, closely following the shape of the extended arm on the fixed contact carrier 7 by the closeness of the base 2 to the terminal 13, and by the closeness of the face plate 1 to the terminal 13 when the unit is assembled. The connection of the neutral load is made to the assembly 27 via insertion of the wire into the terminal 13 which is retained by the screw 15.

A fuse clip (out) assembly 24 is provided at the opposite end of the fuse cavity in the base 2, and is connected to the fuse clip (in) assembly 25. The fuse 23 is held between these two assemblies 24, 25 as will be described later. The fuse clip (out) assembly 24 similarly comprises a round brass terminal 13, with a brass screw 15 which is spun riveted to a fuse clip (out) pressing 9 when the device is assembled. The fuse clip

(out) pressing 9 may be made from spring tempered brass and is generally a "U" form with a leg extending from the base of the "U" and in the same plane. The "U" has a half round form halfway down the one leg acting as a detent for the fuse 23 and matching the fuse clip (in) pressing 9, in position. The extension from the base of the "U" has a hole where the terminal 13 is riveted. It continues on past and ends with an anchor point for adding a neon lamp (not shown), by soldering, if required. Such a lamp would be visible through a window in the face plate to indicate that power is ON. The fuse clip (out) assembly 24 is retained in the base 2, by the closeness of a cavity in the base 2 to the terminal 13, and by the closeness of the face plate 1 to the terminal 13, when the unit is assembled. The "U" form is in the fuse cavity and the back of the "U" form rests against a block moulded at the bottom of the cavity and prevents the fuse clip (out) assembly 24 from turning. The connection of the live load (not shown) is made to the assembly 24 via insertion of the wire into the terminal 13 which is then retained by the screw 15. The switch rocker assembly 30 rests on top of the base assembly described so far and is trapped into position by the assembly of the face plate 1. When the unit is assembled, generally V-shaped projections 44 formed on the sides of the switch rocker assembly 30 become trapped in wider, generally V-shaped notches 46 on the face plate 1, thereby allowing the switch rocker assembly 30 to pivot about the apex of the V-shaped projections 44. The switch rocker assembly 30 comprises a switch rocker moulding 4, preferably moulded from mineral filled nylon, two follower springs 20, and two follower mouldings 6. The follower springs 20 are placed in holes in the switch rocker moulding 4, and the follower mouldings 6 are placed on top of the follower springs 20. The followers 6 are retained by pressing them into position by a poppet action.

When operating the switch rocker assembly 30 into the ON or OFF position, the follower 6 moves from one side of the moving contact carrier assembly 28, balanced on the pivot assembly 26, over the "top dead centre" (T.D.C.) to the other side of the moving contact carrier assembly 28. This toggling over T.D.C., together with the pressure of the follower springs 20, creates a "snap action" to the switch and makes or breaks contact between the moving contacts 22, and the fixed contacts 21.

Before the face plate 1 is attached to the base assembly, the fuse carrier 3 is passed through the face plate 1 from the front and is retained in place by forcing a fuse carrier stop 12 into a rectangular cavity in the underside of the fuse carrier 3. The fuse carrier stop 12 protrudes slightly from the fuse carrier 3 and runs in a groove 47 in the face plate 1. The stop rests against a part of the face plate moulding 1, so as to prevent the fuse carrier from being removed completely from the spur unit. The fuse carrier moulding 3 may be made from a mineral filled nylon. With the fuse carrier assembly 29 in the "out" position, the fuse 23 is placed in a "U" shaped drawer in the moulding. This drawer has material in front of and behind the fuse 23. By pushing the fuse carrier assembly 29 "in" the material 48 in front of the fuse 23 starts to open the "U" in the fuse clip (in) assembly 25 and the "U" in the fuse clip (out) assembly 24. The material behind the fuse 23 pushes the fuse 23 to overcome the pressure of the fuse clip (in) assembly 25 and the fuse clip (out) assembly 24, until the fuse 23 reaches the detent position. At this point the fuse carrier assembly 29 abuts shoulders on four parts 49A-49D of the face plate 1, and leaves the face 3 of the fuse carrier assembly 29 flush with the outer face of the face plate 1. The fuse carrier assembly 29 is guided and controlled through an aperture in the face plate 1 and into a cavity in the base 2 by the sides of the cavity and aperture.

As is apparent from Figure 3 of the drawings, the fuse carrier assembly 29, if (not shown) it were withdrawn, could not be pushed fully "home" with the switch rocker assembly 30 in the ON position because a tab 42 downwardly projecting integrally from the switch rocker assembly 30 would hit an upward protrusion 40 which is provided on the inner surface of the outer wall of the fuse carrier assembly 29 before it can reach the "home" position. Similarly the fuse carrier assembly 29 cannot be withdrawn with the switch rocker assembly 30 in the ON position, as shown in Figure 3, because an attempt to do so would result in the fuse carrier assembly 29 hitting the back of the tab 42 on the switch rocker assembly 30, and continued motion would toggle the switch rocker over centre into the OFF position. If the switch rocker is in an intermediate position between the ON and OFF positions, i.e. between ON and T.D.C., the tab 42 may have dimensions suitable to achieve an interlock between the switch and the fuse carrier assembly so as to toggle the switch rocker over centre into the OFF position. In fact, the dimensions of the tab can be made so as to ensure correct operation of the unit when the rocker switch is at any position between OFF and ON. For example, the tab 42 may be 1 mm long, and have one edge which tapers at approximately  $9^\circ$  towards the outer edge of the switch. The lower end of the tab 42 may also slope, at approximately  $5^\circ$  from the inner to the outer surface of the switch. The protrusion 40 may then be approximately 1.2 mm long. As a result, the fuse may only be removed or inserted when the switch is fully in the OFF position. If the switch is in its ON position or in a predetermined range of intermediate positions between its ON and OFF positions, the fuse carrier is prevented from being inserted, or an attempt to remove the fuse carrier would result in the rocker switch being toggled into the OFF position. The predetermined range may be between ON and OFF, or any portion between ON and OFF, for example, between ON and T.D.C.

As shown in Figure 4 of the drawings, in the OFF position the tab 42 on the switch rocker assembly 30 is clear of the protrusion 40 on the fuse carrier assembly 29, allowing it to be withdrawn without hindrance. For additional security, withdrawal of the fuse carrier assembly 29 cannot be achieved under any circumstance without the insertion of a flat bladed screwdriver into the rectangular recess 50 in the edge of the face plate 1 between the fuse carrier assembly 29 and the face plate 1 and a prising action taking place.

Thus, the present invention provides a switch unit in which there is an interlock between the switch and the fuse, such that the fuse cannot be removed until the switch is in the OFF position. Similarly, the fuse cannot be inserted in order to complete an electrical circuit with the switch in the ON position.

The two mounting hole eyelets 19 are connected together by an earth strap assembly 31. The earth strap assembly 31 has a round, preferably brass, terminal 13, with a brass screw 15 which is spun riveted into a hole in the earth strap pressing 14 when the unit is assembled. The earth strap pressing 14 is preferably made from zinc-plated steel and is generally a "U" shape, to wrap around the base 2, with various rises in levels to clear parts of the face plate 1. The earth connection is made by assembling the wire to the terminal 13 and retaining it with the screw 15.

**CLAIMS:**

1. A switch unit, comprising a switch having first and second operational positions for respectively opening and closing an electrical circuit, said electrical circuit including in series a removable fuse insertable between terminals of the circuit, the switch unit further comprising means for mechanically preventing said fuse from being removed from and/or inserted between the said electrical circuit when said switch is in said second operational position, but for allowing such removal and/or insertion when said switch is in said first operational position.
2. A switch unit as claimed in claim 1, comprising a face plate for affixing to a mounting box, said face plate being formed with a first opening for retaining the switch in an accessible position.
3. A switch unit as claimed in claims 1 or 2, comprising a fuse carrier assembly for removably retaining the fuse in the electrical circuit.
4. A switch unit as claimed in claim 3 when dependent upon claim 2, wherein the fuse carrier assembly comprises a drawer-like member for retaining the fuse, which may be inserted into and extended out of or removed from the switch unit via a second opening in the face plate which is positioned adjacent to the first opening, such that an outer wall of said member lies substantially flush with said face plate when said fuse carrier assembly is fully inserted into the switch unit.
5. The switch unit as claimed in claim 4, wherein the outer wall of the drawer-like member has an area substantially equal to that of the second

opening in the face plate so as to form a closure therefor when the fuse carrier assembly is fully inserted into the switch unit.

6. A switch unit as claimed in claim 4 or 5, wherein the outer wall of the drawer-like member is provided with a protrusion which is affixed to or incorporated into the inner surface of said outer wall, at the edge which is adjacent to the first opening the face plate when the fuse carrier assembly is fully inserted into the switch unit.

7. A switch unit as claimed in claim 6, wherein the switch is a rocker switch which is provided with a projection affixed to or incorporated in the end of the switch which is adjacent to the second opening in the face plate, such that when the end of the switch having a projection is pushed inwards, the projection cooperates with the protrusion on the drawer like member so as to prevent the fuse carrier assembly from being inserted into or extended out from said switch unit.

8. A switch unit as claimed in any preceding claim, wherein said means for preventing the fuse from being removed is arranged to move the switch into its first operational position if an attempt is made to remove the fuse while the switch is in its second operational position.

9. A switch unit as claimed in any of claims 1 to 7, arranged to prevent insertion and/or removal of the fuse only when the switch is in its second operational position.

10. A switch unit as claimed in any of claims 1 to 5, arranged to prevent removal/insertion of the fuse when the switch is either at its second

operational position or in a predetermined range of intermediate positions between its first and second operational positions.

11. A switch unit as claimed in claim 10, in which the predetermined ranges is a portion only of the range of positions between its first and second positions.

12. A spur unit incorporating a switch unit as claimed in any preceding claim.

13. A switch unit substantially as herein described with reference to the accompanying drawings.



Amendments to the claims have been filed as follows

1. A switch unit, comprising a switch having first and second operational positions for respectively opening and closing an electrical circuit, said electrical circuit including in series a removable fuse insertable between terminals of the circuit, the switch unit further comprising means for mechanically preventing said fuse from being removed from and/or inserted between the said electrical circuit when said switch is in said second operational position, but for allowing such removal and/or insertion when said switch is in said first operational position, said means for preventing the fuse from being removed being arranged to move the switch into its first operational position if an attempt is made to remove the fuse while the switch is in its second operational position.
2. A switch unit as claimed in claim 1, comprising a face plate for affixing to a mounting box, said face plate being formed with a first opening for retaining the switch in an accessible position.
3. A switch unit as claimed in claims 1 or 2, comprising a fuse carrier assembly for removably retaining the fuse in the electrical circuit.
4. A switch unit as claimed in claim 3 when dependent upon claim 2, wherein the fuse carrier assembly comprises a drawer-like member for retaining the fuse, which may be inserted into and extended out of or removed from the switch unit via a second opening in the face plate which is positioned adjacent to the first opening, such that an outer wall of said member lies substantially flush with said face plate when said fuse carrier assembly is fully inserted into the switch unit.

5. The switch unit as claimed in claim 4, wherein the outer wall of the drawer-like member has an area substantially equal to that of the second opening in the face plate so as to form a closure therefor when the fuse carrier assembly is fully inserted into the switch unit.

6. A switch unit as claimed in claim 4 or 5, wherein the outer wall of the drawer-like member is provided with a protrusion which is affixed to or incorporated into the inner surface of said outer wall, at the edge which is adjacent to the first opening the face plate when the fuse carrier assembly is fully inserted into the switch unit.

7. A switch unit as claimed in claim 6, wherein the switch is a rocker switch which is provided with a projection affixed to or incorporated in the end of the switch which is adjacent to the second opening in the face plate, such that when the end of the switch having a projection is pushed inwards, the projection cooperates with the protrusion on the drawer like member so as to prevent the fuse carrier assembly from being inserted into or extended out from said switch unit.

8. A switch unit as claimed in any of claims 1 to 7, arranged to prevent insertion and/or removal of the fuse only when the switch is in its second operational position.

9. A switch unit as claimed in any of claims 1 to 5, arranged to prevent removal/insertion of the fuse when the switch is either at its second operational position or in a predetermined range of intermediate positions between its first and second operational positions.

10. A switch unit as claimed in claim 9, in which the predetermined ranges is a portion only of the range of positions between its first and second positions.
11. A spur unit incorporating a switch unit as claimed in any preceding claim.
12. A switch unit substantially as herein described with reference to the accompanying drawings.



Application No: GB 9600529.3  
Claims searched: 1-13

Examiner: Peter Corbett  
Date of search: 11 March 1996

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.O): H1N

Int CI (Ed.6): H01H

Other: Online: WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2260441 A (HARVEY) see page 1 lines 1-18	1,9
X	GB 1212185 (HALL) see Fig 2	1,3,9
X	GB 1148209 (LA TELEMECANIQUE ELECTRIQUE) see Fig 2	1,3,9
X	GB 1135351 (WESTINGHOUSE) see page 5 lines 12-41	1,3,9
X	GB 0939601 (BASSANI) see page 1 lines 62-76	1,9
X	GB 0721888 (PARSONS) see page 3 lines 28-45	1,3,9
X	DE2754195A1 (LAUR) see Fig	1,3,9

X Document indicating lack of novelty or inventive step  
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